Subacute subdural hematomas: Comparison of surgical methods and clinical outcomes

Ziya Asan
Department of Neurosurgery, Faculty of Medicine Ahi Evran University, Kirsehir, Turkey

Abstract

Aim: Although subacute subdural hematoma (SSDH) patients are considered to be similar to chronic subdural hematoma (CSDH) patients, it was aimed to set forth the clinical follow-up and treatment differences between these groups and to compare and discuss the results of different surgical treatments that can be applied. Material and Method: Sixty-seven patients diagnosed with SSDH were retrospectively reviewed, and 57 of them treated surgically. Clinical findings and signs of progress were recorded. The patients were divided and evaluated in two groups; those who underwent surgery with burr-hole trepanation method (Group 1) and those who underwent membranectomy with craniotomy (Group 2). Outcomes were compared in 2 groups. The way how the membranectomy with the craniotomy procedure is applied has been explained. Results: In Group 1 subdural space and pneumocephalus were wider in the early postoperative period (average width: 13,2 mm; 24,6 mm). In Group 2, subdural space and pneumocephalus widths and lengths were an average of 4,6 mm and 11 mm. In Group 1, the late period re-operation rate was 17,1%, whereas, in Group 2, those rates were determined to be 9,1%. Discussion: SSDH patients show different clinical course than CSDH patients. Burr-hole trepanation method is not as efficient as the craniotomy method in surgical patients. In patients undergoing craniotomy and membranectomy, the likelihood of the remnant and pneumocephalus is lower in the postoperative period. Parenchymal expansion can be achieved in the early period with positive-end-expiration-pressure for a few seconds in the intraoperative period.

Keywords

Subacute Subdural Hematoma; Chronic Subdural Hematoma; Subdural Hematoma; Membranectomy; Burrhole

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Corresponding Author: Ziya Asan, Beyin ve Sinir Cerrahisi Kliniği, Ahi Evran Üniversitesi Eğitim ve Araştırma Hastanesi, 40000, Kırşehir, Türkiye.
GSM: +905336502641 F.: +90 3862803917 E-Mail: ziyaasan@gmail.com
ORCID: 0000-0001-8468-9156

Introduction

Although subdural hematomas are the most common intracranial hemorrhages, subacute subdural hematomas (SSDH) are in the least commonly detected group. Frequently SSDHs and chronic subdural hematomas (CSDHs) are evaluated similarly in the literature, and they are followed-up and treated using the same method [1]. However, SSDH patients differ from CSDH patents regarding age, symptom, clinical findings and prognosis. Since SSDH patients are evaluated with CSDH patients, the surgical methods applied are also similar. Different surgical methods are applied [2-4]. The superiority of these methods to each other is still being discussed in the literature [5,6]. Subdural hematoma recurrence, epilepsy, pneumocephalus, hospitalisation duration, infection and the degree of invasiveness of the surgical method are the main topics discussed for the performed procedures.

Material and Method

Records and radiological examinations of 67 patients (40 male and 27 female) diagnosed with subacute subdural hematomas were retrospectively reviewed. The average age was determined to be 64,6 (12-80). The most frequent etiologic cause was determined to be a recent history of head trauma. The most common admission symptom was a headache. Ten patients were followed-up by a conservative treatment. Surgical intervention was performed at the time of diagnosis in 53 patients. Four patients were operated upon the clinical and radiological findings' progression in the follow-up period. In 35 of the patients who underwent surgery, burr-hole trepanation method was performed while in 22 of the patients, membranectomy with craniotomy was performed. On the first postoperative day, CT scan was performed to evaluate the surgical outcome in all surgical patients. Subdural space and pneumocephalus measurements were performed at the end of CT, and the results of both groups were compared. Diphenylhydantoin medication was given as an antiepileptic drug to all patients postoperatively. Hospitalisation duration, postoperative clinical findings and complications were recorded. Demographic characteristics of the patients are shown in Table 1.

Ethical approval: Ethics Committee Approval was obtained from Ahi Evran University Clinical Research Ethics Committee on 08.08.2017 no:2017-13/145.

Surgical Technique:

Twenty-nine of 35 patients operated with burr-hole trepanation method, 29 were operated under sedation. In all patients, double burr-hole and subdural washout were performed with the physiological saline solution, and the patients were followed-up with closed system drainage for 48-72 hours.

In 22 patients operated with craniotomy, craniotomy flap was opened as the way that hematoma locates at the centre of craniotomy flap. Since the parenchyma is known to be under compression due to hematoma, the craniotomy flap was opened to be smaller than the area where hematoma occurs. After the dura was opened and the hematoma was drained, 1-2 cc physiological saline solution was injected beneath the membrane to ensure a safe distance for the incision between the membrane and the parenchyma. Since the parenchyma was still under the influence of compression, the area outside the craniotomy area can be reached by making a membrane incision. To obtain sufficient expansions of the parenchyma, the distant regions where the membranectomy is terminated were excised in the form of a triangle which base faces to craniotomy flap. Large slice membranectomies were performed in the areas where the membrane could not be completely excised. To provide an earlier parenchyma expansion and bleeding control, 5-second positive-end-expiratory-pressure (PEEP) was applied for 3-4 times. The surgeries were terminated by closing the dura watertight.

Results

In the 1st postoperative day tomography examinations of the patients operated with burr-hole trepanation method, the subdural space was determined to be significantly higher (mean width: 13,2 mm; $p<0,05$). Also in this group, the rate of pneumocephalus in subdural space was found to be significantly higher (mean length:24, 6mm; $p<0,05$). Three patients were re-operated before they were discharged due to acute subdural hematoma in the same region and craniotomy was performed in these patients. The average hospitalisation time of patients in this group was recorded as 7,3 days. On the other hand, in patients from Group 2 who underwent craniotomy and membranectomy, the duration of surgery and hospitalisation (7,7 days) were found to be higher ($p<0,05$). One of the patients in this group had epileptic seizures and dysphasia in the postoperative period. No mortality was encountered in either group. The average late follow-up length of both groups of 52 patients in the postoperative period was 15,3 months. After radiological examinations; SDH was detected in the chronic period (average 0,6 cm) in 17 patients operated with burr-hole trepanation. The SDH thickness average was determined to be 0,3 cm in 5 patients operated with the craniotomy. In Group 1, the late period re-operation rate due to chronic subdural hematoma was 17,1%, whereas, in Group 2, those rates were determined to be 9,1%.

Discussion

Subdural hematomas are the most common intracranial hemorrhages. SSDH patients constitute the least seen group among SDH types. SSDH patients share similarities with CSDH patients regarding the clinical course. For this reason, the patients diagnosed with CSDH are evaluated with SSDH patients in the literature [1]. There was no study investigating patients diagnosed only with SSDH. In this study, the symptoms, clinical course and the differences in the surgical treatment results of SSDH patients were brought out.

Such complaints as a headache and dizziness are frequently detected in the symptomatology of CSDH cases. This is closely related to the reduction of the venous flow on the relatively atrophic parenchyma, rather than the raising intracranial pressure effect of the hematoma. In SSDH patients, the hematoma development period is shorter, and since it is seen in relatively younger age group, the most obvious symptom, is a headache associated with increased intracranial pressure due to a low parenchymal tolerance.

In the pathophysiology of CSDH patients, stretching and breaking of the bridging veins depending on the atrophy of the cere-

bral parenchyma is most often held responsible. These patients often experienced recent mild head trauma. Continuous hemorrhages in these veins are also held responsible for the increase of the CSDH. SSDH patients, on the other hand, most frequently had the past head trauma. In these patients, the hemorrhage in the subdural space is slowly progressive than the one in acute SDHs but rapidly progressive than the one in CSDH patients. It is expected to be symptomatic in the early period because of the lower frequency of parenchymal atrophy and lower parenchymal tolerance as it is more frequently occurs in younger age groups than it does in CSDH patients.

It remains to be argued which method is more efficient in the surgery of SSDH and CSDH patients who will undergo surgical intervention [7-9].Today, burr-hole trepanation method is preferred because it is minimally invasive. However, recurrence and pneumocephalus are encountered more frequently with this surgical method [10]. In patients operated with craniotomy, on the other hand, it is criticised that the method is more invasive and the possibility of postoperative complications is more frequent. In general, in patients with poor general condition and having no septation, thought to be operated with sedation, the burr-hole trepanation method is more frequently preferred because it is minimally invasive.

Although it is not a general rule, in patients with recurrences who are being treated with the burr-hole trepanation method, the craniotomy may be preferred in situations where the presence of septation is detected within the hematoma. There are studies in which membranectomy was also performed in such patients [2,4,10,11].

In our study, in two groups of patients diagnosed with SSDH, the results of the ones operated with burr-hole trepanation method (Group 1) and those operated with craniotomy (Group 2) were shown in Table 1.

Table 1. Demographic characteristics and surgical results of the patients.

	Group 1	Group 2
Sexuality	M : 20 F : 15	M : 14 F : 8
Age	64,5	65,1
Side of the Haematoma	R : 15 L : 16 B : 4	R : 12 L : 10 B : 0
Postoperative Subdural Width	13,2 mm (average)	4,6 mm (average)
Postoperative Pneumocephaus Length	24,6 mm (average)	11,0 mm (average)
Reoperation due to CSDH	6	2
Hospitalisation time	7,3 days (average)	7,7 days (average)
Postoperative Subdural Effusion (Late period)	6 mm (average)	3 mm (average)

(M: male, F: female, R: right, L: left, B: bilateral, CSDH: chronic subdural hematoma)

When SSDHs were compared with CSDHs, it was seen that the hematoma was significantly denser and thicker in nature than chronic hematoma (Figure 2). When the burr-hole trepanation method is applied, it is more difficult to drain the hematoma from the subdural space after irrigation because it is not as fluid as the CSDH. For this reason, the possibility of remnant hematomas remaining at subdural space after the SSDHs are

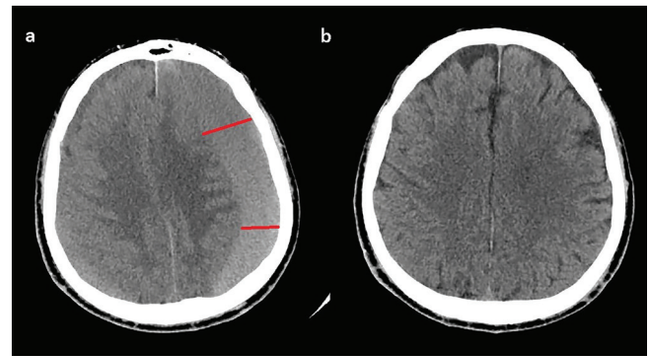

Figure 1. Left frontoparietal wide subacute subdural hematoma (a). Postoperative CT on the 3rd day. Subdural space was completely closed, the parenchyma was completely expanded, and there was no pneumocephalus (b).

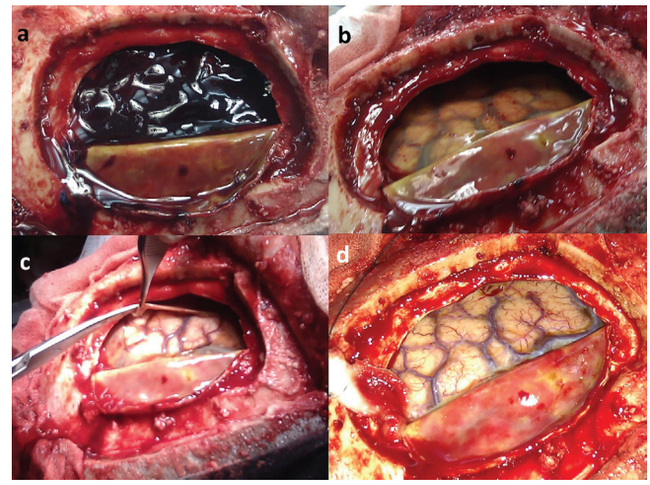

Figure 2. Craniotomy flap opened smaller than the area where hematoma occurs. The nature of hematoma is dense and difficult to evacuate with burrhole trepanation (a). Wide subdural space before membranectomy (b). Membrane tissue excision. Slice membranectomy performed at regions distant from the flap facilitates the expansion of cerebral parenchyma (c). PEEP applied immediately after the membranectomy provides rapid brain parenchyma expansion, even in the intraoperative period (d).

operated with burr-hole trepanation is more likely. In patients operated with craniotomy, it was seen that cerebral parenchyma began to expand in the intraoperative period immediately after the application of the membranectomy. After this procedure, with the positive expiratory end pressure (PEEP) applied several times for 5-7 seconds, it was seen that the parenchyma expanded more and closed the subdural space (Figure 2). This manoeuvre provides a much more pronounced expansion in younger age groups and in patients with nonatrophic parenchyma.. Furthermore, this manoeuvre helps to detect and intervene easily in the possible locations of hemorrhages that may occur at subdural spaces. .

Conclusion

In the surgery of SSDH patients, the burr-hole trepanation method results in a greater probability of subdural remnant, recurrence, and pneumocephalus in the postoperative period. Even though membranectomy method applied with craniotomy is a more invasive method, the likelihood of recurrence is lower with this method. With the application of PEEP during surgery, the greater expansion of the cerebral parenchyma can be provided, and the subdural space can be reduced. Since SSDH cases are seen at a younger age compared to CSDH cases, the rate of age-related complications is expected to be lower as the

cerebral parenchyma is rapidly expanded. Pre-operative evaluation of patients is important in determining which method will be more effective.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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